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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/656,182 | 09/08/2003 | Allen McTeer | M4065.0248/P248-C | 8422 |
| 24998 | 7590 | 09/08/2004 | EXAMINER | |
| DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP | | | LEE, EUGENE | |
| 2101 L STREET NW | | | | |
| WASHINGTON, DC 20037-1526 | | | ART UNIT | PAPER NUMBER |
| | | | 2815 | |

DATE MAILED: 09/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/656,182

Applicant(s)

MCTEER, ALLEN

Examiner

Eugene Lee

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 74-83 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 79-83 is/are allowed.
- 6) ☒ Claim(s) 74-78 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>9/8/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Embodiment I (claims 74-78) in paper filed 8/13/04 is acknowledged. The traversal is on the ground(s) that the claims 74-83 are define closely related subject matter that can be searched and examined in the present application without serious burden. This is found persuasive and restriction is withdrawn. Claims 74-83 are under examination.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: element 32 (see page 13, line 3). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 75 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is not clear how “said copper layer has a thickness of about 50 Angstroms to about 200 Angstroms” when in parent claim 74, the copper layer is stated to have “a thickness of about 500 Angstroms to about 20,000 Angstroms.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 74, 77, and 78 are rejected under 35 U.S.C. 102(e) as being anticipated by Braeckelmann et al. 6,218,302 B1. Braeckelmann discloses (see, for example, FIG. 11) a copper bond pad comprising a substrate, dielectric layer 110, barrier layer 122, seed layer (copper layer) 42/43, and dielectric film (insulating layer) 71. In column 4, lines 27-34, Braeckelmann discloses the seed layer comprising copper and may include titanium. In column 4, lines 47-49,

Braeckelmann discloses the seed layer having a thickness in a range of approximately 150-200 nanometers (=1500-2500 Angstroms).

Regarding claim 78, see, for example, column 3, lines 3-7, Braeckelmann discloses the dielectric layer being PSG (phosphosilicate glass).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 75 is rejected under 35 U.S.C. 103(a) as being unpatentable over Braeckelmann et al. '302 B1 as applied to claims 74, 76, and 78 above, and further in view of Werkhoven et al. 6,703,708 B2. Braeckelmann does not disclose the copper layer having a thickness of about 50 Angstroms to about 200 Angstroms. However, Werkhoven discloses (see, for example, column 17, lines 13-15) a semiconductor device comprising a copper seed layer 436 wherein the copper seed layer has a thickness of greater than 100 Angstroms (50 Angstroms to about 200 Angstroms). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have the copper layer have a thickness of about 50 Angstroms to about 200 Angstroms in order to have a base layer of adequate thickness to form a subsequent conducting layer, and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

8. Claim 76 is rejected under 35 U.S.C. 103(a) as being unpatentable over Braeckelmann et al. '302 B1 as applied to claims 74, 76, and 78 above, and further in view of Dubin et al. 5,891,513. Braeckelmann does not disclose a passivation layer being formed of a material selected from the group consisting of silicon oxide, oxynitride, silicon nitride, borophosphosilicate glass and polyimide. However, Dubin discloses (see, for example, FIG. 13) a semiconductor device comprising a SiN (silicon nitride) layer (passivation layer) 35. In column 9, lines 12-15, Dubin discloses the SiN layer functioning as a dielectric barrier layer to encapsulate the copper. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have a passivation layer being formed of a material selected from the group consisting of silicon oxide, oxynitride, silicon nitride, borophosphosilicate glass and polyimide in order to have a dielectric barrier layer that encapsulates the seed layer, and since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Allowable Subject Matter

9. Claims 79 thru 83 are allowed.

10. The following is a statement of reasons for the indication of allowable subject matter: The references of record, either singularly or in combination, do not teach or suggest at least an interconnect structure, said interconnect structure comprising: a conductive bond pad containing a copper layer; and a titanium-aluminum-copper-nitrogen layer over at least an upper surface portion of said copper layer.

INFORMATION ON HOW TO CONTACT THE USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugene Lee whose telephone number is 571-272-1733. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Eugene Lee
August 30, 2004

A handwritten signature in black ink, appearing to be 'Eugene Lee', with a long horizontal line extending to the right.